CLAIMS

I claim:

1. A thruster for use with an external power supply, the thruster comprising:

a propellant that exists in a non-gaseous state at standard temperature and pressure, the propellant having a melting point T_m, a boiling point T_b, and an evaporation rate;

a reservoir adapted to house the propellant, the reservoir selectively heated to a temperature greater than T_m and less than T_b; and

a power control mechanism positioned to control the amount of power from the external power supply being deposited into the reservoir to control the evaporation rate of the propellant.

2. The thruster set forth in claim 1, wherein the propellant comprises a metal.

3. The thruster set forth in claim 1, wherein the propellant comprises at least one of bismuth, mercury, cesium, cadmium, iodine, tin, indium, lithium and germanium.

4. The thruster set forth in claim 1, wherein the propellant exists in a solid state at standard temperature and pressure.

5. The thruster set forth in claim 1, wherein the amount of power from the external power supply deposited into the reservoir is approximately 20% of the total power supplied to the thruster.

6. The thruster set forth in claim 1, wherein the amount of power from the external power supply deposited into the reservoir ranges from approximately 15% to approximately 25% of the total power supplied to the thruster.

7. The thruster set forth in claim 1, wherein the reservoir comprises an anode in an electric circuit, and further comprising:

a body having an axial direction and a radial direction;

at least one passage in the reservoir to allow propellant vapors to escape the reservoir;

a cathode positioned to emit electrons downstream of the body to create a substantially axial electric field with respect to the body, the electrons adapted to ionize the propellant vapors that have escaped the reservoir; and

magnetic poles arranged to create a radial magnetic field that interacts with the axial electric field to produce a current of ionized propellant vapors according to the Hall effect.

8. The thruster set forth in claim 1, wherein the power control mechanism comprises an electrode positioned downstream of the reservoir to control at least one of the temperature of the reservoir and the evaporation rate of the propellant.

9. The thruster set forth in claim 1, wherein the reservoir comprises an anode.

10. The thruster set forth in claim 9, wherein the power control mechanism comprises a segmented anode formed of the anode and at least one electrode positioned downstream of the anode.

11. The thruster set forth in claim 10, wherein the anode and the at least one electrode are thermally isolated from one another.

12. The thruster set forth in claim 10, wherein the anode and the at least one electrode are separated by a potential difference.

13. The thruster set forth in claim 9, further comprising:

an electron source positioned to ionize propellant vapors by removing electrons from propellant vapor atoms;

at least one electrode positioned downstream of the anode to attract a fraction of electrons from the electron source and divert the electrons to control at least one of the temperature of the anode and the evaporation rate of the propellant.

14. A thruster comprising:

a propellant that exists in a non-gaseous state at standard temperature and pressure;

an anode having a temperature and adapted to house the propellant in a liquid state;

at least one passage in an outer wall of the anode to allow propellant vapors to diffuse outwardly of the anode at a propellant supply rate;

an electron source positioned to ionize diffused propellant vapors; and

at least one electrode positioned downstream of the anode to attract a fraction of electrons from the electron source and divert the electrons to control at least one of the temperature of the anode and the propellant supply rate.

15. The thruster set forth in claim 14, wherein the propellant comprises at least one of bismuth, mercury, cesium, cadmium, iodine, tin, indium, lithium and germanium.

16. The thruster set forth in claim 14, wherein the propellant comprises a metal.

17. The thruster set forth in claim 14, wherein the propellant exists in the solid state at standard temperature and pressure.

18. The thruster set forth in claim 14, further comprising a thermal insulator positioned to thermally isolate the anode and the at least one electrode.

19. The thruster set forth in claim 14, further comprising a voltage differential applied between the anode and the at least one electrode to cause electrons to move from the at least one electrode to the anode.

20. The thruster set forth in claim 14, further comprising:

a thruster body having a generally cylindrical shape with an axial direction and a radial direction;

an electric field established between the electron source and the anode, the electric field being directed substantially axially with respect to the thruster body, and

magnetic poles positioned to create a radial magnetic field that interacts with the electric field to cause the ionized propellant vapors to move generally downstream in the thruster according to the Hall effect.

21 The thruster set forth in claim 14, wherein the anode is maintained at a temperature above the melting temperature of the propellant and below the boiling temperature of the propellant.

22. A method for producing a thrust in a thruster having an external power supply, the method comprising:

providing a propellant that exists in a non-gaseous state at standard temperature and pressure, the propellant having a melting temperature T_m and a boiling temperature T_b;

providing a reservoir to house the propellant;

selectively heating the reservoir to a temperature greater than T_m and less than T_b;

vaporizing the propellant to form propellant vapors at an evaporation rate; and

controlling the amount of power from the external power supply that is deposited into the reservoir to control the evaporation rate of the propellant.

23. The method set forth in claim 22, wherein the propellant comprises at least one of bismuth, mercury, cesium, cadmium, iodine, tin, indium, lithium and germanium.

24. The method set forth in claim 22, wherein the propellant exists in a solid state at standard temperature and pressure.

25. The method set forth in claim 22, wherein the reservoir comprises an anode, and further comprising providing at least one electrode positioned downstream of the anode.

26. The method set forth in claim 25, further comprising applying a voltage differential between the anode and the at least one electrode.

27. The method set forth in claim 25, further comprising:

bombarding the propellant vapors with electrons from an electron source to produce more electrons;

attracting a fraction of the electrons with the at least one electrode;

applying a voltage differential between the anode and the at least one electrode; and

selectively diverting the fraction of electrons with the at least one electrode to control the amount of power deposited into the anode.

28. The method set forth in claim 27, wherein an electric potential is established between the electron source and the anode, and further comprising:

controlling the electric potential between the electron source and the anode; and

controlling the voltage differential between the anode and the at least one electrode.

29. The method set forth in claim 25, further comprising bombarding the propellant vapors with electrons from an electron source to produce more electrons, and wherein controlling the amount of power from the external power supply that is deposited into the reservoir includes attracting a fraction of the electrons to the at least one electrode.

30. The method set forth in claim 22, further comprising:

providing at least one passage in the reservoir to allow propellant vapors to escape;

ionizing the escaped propellant vapors to form a plasma;

establishing an electric field to cause the plasma to flow;

establishing a magnetic field normal to the electric field that interacts with the electric field to cause the plasma to flow according to the Hall effect.